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SYSTEM PLANNING CORPORATION

SYSTEMS ENGINEERING AND TECHNICAL ASSISTANCE

FINAL TECHNICAL REPORT

November 1988 APPROVED FOR PUBLIC RELEASE
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Defense Sciences Office, Materials Sciences Division
1400 Wilson Boulevard
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ARPA Order nos. 6272 and 9527

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I. Introduction

This document constitutes the Final Technical Report by System Planning Corporation (SPC) for Contract MDA972-88-C-0004 to provide Systems Engineering and Technical Assistance to the Defense Sciences Office (DSO) of the Defense Advanced Research Projects Agency. The task objectives set forth in the Statement of Work for this contract were:

a. Task 1. Evaluation Support. SPC will support DSO in appropriate cases, reports, and other documents dealing with materials research, development, manufacture, and application.

b. Task 2. Library Support. SPC will develop and maintain a DSO library for documents relating to high-temperature superconductors and other subjects, as required. Access to the library will be controlled by specified DARPA personnel. This effort will include the establishment of a reading room as well as the use of reproduction facilities for controlled or classified documents.

c. Task 3. Technical Documentation. SPC will provide services and facilities for technical documentation support as required. This will include the conversion of technical data into reports and presentation material, as well as the cataloging and storage of this and related material.

d. Task 4. Conference Support. SPC will provide technical and administrative support for at least five technical conferences, to be held within one block of DARPA. Each conference will host up to 150 attendees, and as many as 250 attendees. SPC will supply the facility, classified if necessary; prepare and mail "call-for" papers and the program agenda; and provide audio-visual services and equipment, security services, and open cafeteria services when necessary.

e. Task 5. Engineering/Analysis Services. SPC will supply engineering and analysis services in support of DARPA/DSO programs as required. This will include interface with other contractors and the generation of a final report at the completion of each task.

f. Task 6. Management Support Services. SPC will monitor prime contracts let by DARPA/DSO. This will include the maintenance of program schedules and technical milestones.

Specific work performed in the execution of these tasks is contained in the body of this report which follows.

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II. WORK PERFORMED

1. **Methodology:** The methodology employed by SPC in the performance of its obligations under this contract was to conduct a thorough evaluation of each task objective and then to assign the accomplishment of specific task objectives to the appropriate functional group within SPC.

2. **Technical Problems:** No technical problems were encountered.

3. **Technical Results:**

a. **Task 1.** SPC supported a DSO proposal-gathering effort in three major areas: high temperature superconductors, computational mechanics and armor materials development. SPC worked closely with the designated program manager of each effort in the following areas: organization, including labeling, establishing a complete filing system at both the appropriate DSO program manager's office and the DSO library maintained at SPC, and entering pertinent information into a computerized data base; extensive photocopying and distribution of proposals for review board members; and coordination of the evaluation and review process at SPC facilities. Additionally, SPC supported the DSO program manager's during the initial stages of the contracting process, including writing and mailing letters for each of the proposals submitted, and developing and preparing relevant documents.

b. **Task 2.** SPC established and maintained a technical library that included documents relating to high temperature superconductors, manufacturing science, armor/anti-armor, computational mechanics, and advanced gun systems. SPC provided office space, furnishings, telephone, and security for controlling access, as part of its library services. The library was also used as a reading room and place for informal meetings by DARPA-approved personnel.

c. **Task 3.** SPC provided extensive technical documentation support by assembling and verifying financial data for DSO programs; collecting and updating mailing lists, including the creation and maintenance of a computerized data base; converting technical data into presentation materials; and cataloging and storing these presentation materials. Included in SPC efforts to support this task was the preparation of the following technical reports and presentations:

- (1) "Listing of SPC Armor Materials Documents," December '87.
- (2) "Intelligent Processing of Materials," February '88.
- (3) "Advanced Materials Gun System Provides an Opportunity to Dramatically Increase Firepower," February '88.
- (4) "Armor Materials Program" database and review sheets book, March '88.

- (5) "Computational Mechanics Program" database and review sheets book, March '88.
- (6) "Chemical and Biological Defense," March '88.
- (7) "A New/BTI Initiative: Advanced Armor Materials," March '88.
- (8) "DARPA's High Temperature Superconductivity Program," April '88.

d. Task 4. SPC planned, coordinated and managed a large number of DSO conferences ranging in size from 5 to 175 attendees. Several of these conferences were classified. SPC furnished the facilities for these conferences, provided security services, prepared and mailed invitations, prepared agendas, designed presentation materials, and provided audio-visual support and equipment. SPC also recorded, prepared and distributed conference proceedings.

e. Task 5. SPC provided engineering/analysis services in a number of areas. Specifically, SPC prepared development options for the Advanced Submarine Technology Program, formulated detailed composite material development plans and examined the effect of vaporific overpressure enhancement of shaped charge munitions for enhanced lethality. In the execution of this task, SPC served as the DSO point of contact for contractor participation and coordinated other contractors' efforts. SPC also prepared final reports for each task.

f. Task 6. SPC maintained program schedules and technical milestones for the High Temperature Superconductivity Program.

4. Findings. Significant results from this effort are derived from the research conducted on vaporific overpressure enhancement on shaped charge lethality. A review of the available literature did not reveal evidence that a vaporific overpressure effect resulted from the interaction of a shaped charge (copper liner) and tank armor (RHA). However, modeling conducted in support of this effort, that assumed the existence of a vaporific overpressure effect, indicated that such an effect could result in enhancing the lethality of shaped charge munitions.

5. Significant Hardware Development: No hardware development resulted from this effort.

III. CONCLUSION

1. Conclusions: Significant conclusions resulting from this effort are that a vaporific overpressure effect has the potential to increase shaped charge munitions' lethality.
2. Implications for Further Research: Vaporific overpressure enhancement to shaped charged munitions' lethality warrants further research into vaporific overpressure effects.

IV. BIBLIOGRAPHY

Chawla, M.S., Brassard, D.J., and Hafer, A.S., Vaporific Overpressure Enhancement to Shaped Charge Lethality, Report 1233, System Planning Corporation, Arlington, Virginia, June 1988.